

# MobyDAQ 16PA

TEAC Mobility package USB 2.0 System



USB 2.0 480 MBIT (USB 1.1 12 MBIT COMPATIBLE)

BNC connectors for analog inputs

Powerful signal processor DSP56311 (255 MIPS)

Analog Inputs/Outputs with 16 BITS resolution

16 CH ADC 16 BIT 500 kHz, 4\*16 BIT DAC 100 kHz

IEPE-type sensor supply (constant current)

Up to three measuring processes in parallel

24 digital Inputs/Outputs selectable per BIT

2\*24 BIT Counter, pulse width, period length, frequency counter

1\*24 BIT incremental encoder measurement, 16 BIT time stamp

24 BIT pulse width modulation 2Hz – 2500 kHz, resolution 100 ns

Free drivers for major application software, TEAC MobySoft Data Acquisition software provided as standard



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## TEAC Mobility package USB 2.0 System

With the introduction of MobyDAQ16PA – which is equipped with an USB 2.0 interface – a new age of measurement technology begins. TEAC is among the first manufacturers to offer an USB 2.0 system which integrates the newest technologies of all key areas. MobyDAQ16PA is an outstanding high end world class product.



### EXTENSIVE SOFTWARE SUPPORT

EdasWin



EVApro

DIAdem



DASYLab

LabVIEW



TEAC MobySoft

#### OS support:

Windows98SE (partial support)

Windows ME

Windows 2000

Windows XP

#### Powerful Online Functionality:

FFT, FIR, Filter, and PID Control

Wave Form Generator, Sine, Square,

Triangle, Downloading Files

The easy to connect USB 2.0 interface permits unrivalled portability. Hotplugging while the measurement box is still running has become a reality now. The compact measurement unit with its BNC connectors makes the formerly needed breakout boxes obsolete. Full downward compatibility to USB 1.1 also permits to run this high performance measuring system with older hardware. Simplicity of integration, whether mobile or stationary, has reached a new level.

With a maximum of 480Mbit/s, the second version of USB permits a 40 times higher bandwidth. Since the USB bus itself cannot guarantee real time operation or low latencies. A fully autonomous DSP control is implemented in the design of MobyDAQ16PA. Integrated timers provide clock and control, and the data is stored in a buffer to ensure unconditional reliability.

For many years TEAC has developed and produced intelligent high performance measurement systems which are based on digital signal processors. The long time experience within this area not only allows to override the missing functional features of USB especially compared to other more conventional measurement systems.

Furthermore, MobyDAQ16PA is equipped with digital signal processors which have several timers integrated. This permits to provide clock and control for several measurement processes independently. Core part of the MobyDAQ16PA is the Motorola signal processor DSP56311 running at 150MHz. It offers computing power up to 255 MIPS, and has 128\*24 kByte internal RAM. External 1.5 Mbyte fast SRAM can be used for programs and data., measuring sequences and online filtering.

### DSP REDUCES PC LOAD

The DSP controls the measuring tasks and it also permits, with the so called online functions, to process data in real time which is otherwise impossible using the USB bus. The online functions can be configured by the user. Algorithms of filters, PID control or FFT can be selected. For any of these functions the processing of data takes place on the MobyDAQ16PA without putting load on the host PC. This is also true for the outputs.

The USB bus permits PID control or trigger functions including the switching of outputs in real time. The response time for such control is merely one sample period interval. For 100 kHz it equals to 10  $\mu$ s.

### STAND ALONE OPERATION

Because of the flexible power supply, MobyDAQ16PA can be operated in stand alone mode. The measuring sequence can be programmed and after this the PC can be disconnected, while MobyDAQ16PA is still processing the control task by itself. If the same sequence is used regularly, it can be stored in the onboard Flash ROM. After powerup, the sequence is started automatically without a connection to the PC. Connecting to a PC host is possible at any time, even during operation.

### ANALOG INPUTS

The input signals are digitized using the multiplex method. All 16 channels may be used as differential or single-ended inputs. The maximum sampling rate is 500kHz at 16 bit resolution (400kHz for multiple channels). The maximum bandwidth per channel is DC to 22kHz. In single-ended mode AC coupling is also available and constant current sensor supply for IEPE-type sensors can be provided. The input circuitry consists of a software programmable precision amplifier with gain 1/2/4/8/10/20/40/80. The input voltage ranges are:  $\pm 0.125V$ ,  $\pm 0.25V$ ,  $\pm 0.5V$ ,  $\pm 1.0V$ ,  $\pm 1.25V$ ,  $\pm 2.5V$ ,  $\pm 5V$ ,  $\pm 10V$ ,  $0-0.125V$ ,  $0-0.25V$ ,  $0-0.5V$ ,  $0-1V$ ,  $0-1.25V$ ,  $0-2.5V$ ,  $0-5V$ ,  $0-10V$ . Along with the analog lowpass filters the system can make use of integrated oversampling filters (up to 16x, depending on channel count and sampling rate) in order to improve rejection of noise, distortion and out of band signals

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## TRIGGERS

There are several trigger conditions available: Level, edge, limits, or window conditions. Measured data can be processed mathematically and in dependence of the steepness of the resulting curve (steepness of gradient), processing can be initiated even in threshold and window conditions. Trigger conditions becoming true can start or stop a measurement, can set digital outputs or control analog outputs.

As an option trigger conditions can activate or deactivate themselves crossover. So a network of dynamic triggers is available depending on the proceedings of the measurement. Trigger conditions can be configured to be retriggerable. After a certain condition becomes true, they are activated or deactivated to achieve the same or a changed observation.

## ANALOG OUTPUT

MobyDAQ16PA offers four analog outputs. The output sampling rate is 200 kHz at 16 bit resolution. It works with 200 kHz per channel. A current of up to  $\pm 5$  mA can be sourced. The output voltage ranges are  $0V-10V$  und  $\pm 10V$ . It is possible also to download data to MobyDAQ16PA and to output it to the D/A converters time synchronized by the DSP.

## DIGITAL INPUTS/OUTPUTS

There are 24 digital inputs/outputs available. Any of these ports may be individually controlled by the DSP as input or output.

## PULSE WIDTH MODULATION

MobyDAQ16PA can output PWM signals with a resolution of 100ns and output frequencies between 2Hz and up to 2,500,000Hz. Pulse width modulation is a special feature in the world of measurement. For this kind of pulse width modulation no interruptions or pulse discontinuities are permitted. If frequency or pulse width is changed, the actual period is output until it is fully completed and then the new settings are used without any discontinuities. Modulation of frequency and pulse width is supported at the same time and it is fully transparent to the user who only specifies a frequency and the pulse width in percent. If frequency is changed the duty cycle is kept. Changes of the pulse width lead to a kept frequency.

## MEASURING WITH INCREMENTAL ENCODERS

A counter with 24 bit resolution including direction detection and a 16 bit counter for time stamping are available. Interpolation can be switched between 1x, 2x, and 4x and it is equipped with a zero posi-

tion detection with programmable edges which can be activated/deactivated at any time. Therefore the board is the perfect choice for tasks like flow measurements. The time stamp serves to measure the velocity of the measured object exactly.

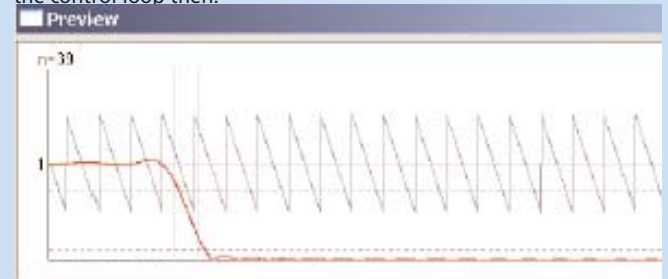
## ONLINE FUNCTIONALITY

MobyDAQ16PA offers a wide variety of online functions like filters, signal analysis like FFT, control algorithms (PID), and threshold observation. Any of these functions are processed on the signal processor without any effort of the PC. So any of the measured values can be processed immediately after measuring it.

A controller is able to adjust the manipulated value in an extremely short period of time if the input value changes respectively. For none of these operations any effort has to be made by the PC. The processing of data is achieved immediately after measuring it without any additional delay.

## FILTERS SUPPRESS DISTORTIONS

Filters suppress undesired frequencies and distortions. Therefore the user gets useful data only. A combination of filters and controllers permit to remove distortions first and depending on the data to control the control loop then.



All of these functions are integrated in MobyDAQ16PA. There is no need for any additional hardware.

Distortions caused by cabling, signal conditioning in-between, or several contacts are avoided. Furthermore the delay between input and output is extremely short which permits real time control. Sometimes the different time associations of measurement hardware of different manufacturers can lead to problems.

## TIME STAMPS

If analog channels, digital inputs and counter readings are measured with different systems it is usually impossible to associate the signals to a certain point of time. This gap is closed by TEAC MobyDAQ16PA as well.

The signal processor offers the possibility to observe digital inputs and counter signals like analog inputs and to measure data with synchronized time. Channels of any type are measured and stored as a single sample which ensures time synchronization.

## SOFTWARE

One of the most important criteria for modern measurement systems, and also a major reason for buyer's decision, is software support. Even the most powerful hardware cannot be used without respective drivers. Having this in mind, TEAC MobyDAQ16PA driver software uses an optimized concept which ensures extensive application software support and easy adaption to new software environments.

### TEAC MobySoft

Many measurement tasks make it necessary to store measured data to disk for later processing. TEAC MobyDAQ16PA is shipped with the software package TEAC MobySoft which is exceptionally easy to use. Just plug and measure. Data can be acquired quick and easy and the whole gathered information can be viewed on one screen.

TEAC MobySoft provides two monitor modes: Waveform mode and bar graph mode. Any of the channels is equipped with a level indicator, and it is possible to choose RMS or PEAK value. Acquired data is stored in the TAFFmat file format. So it is possible to use one of the many data analysis packages available from the third party analysis software market. To make its use even more convenient any blocks of acquired data are stored in a separate directory on the disk.

Besides free of charge drivers for most common measurement applications like EdasWin, EVApro, DIAdem, LabView or DasyLab further application programs are available. Custom driver support is possible on request.

### SOFTWARE AND DRIVER UPGRADES

The most recent versions of drivers, programming interface and software can be downloaded free of charge from the TEAC website at <http://www.teac-instruments.com>.

### TECHNICAL DATA:

Analog Input		Analog Output	
Converter type	AD7665	DAC7734	
Number of inputs	16	Number of outputs	4
Input Impedance	1 MV differential		
Analog bandwidth	1 – 20 kHz / 1 dB DC		
	1 Hz – 20 kHz / 1 dB AC, IEPE		
ADC sample rate	500 / 400 kHz	DAC sample rate	100 kHz
Resolution	16 Bit		16 Bit
Conversion time	2 µ	Settling time	± 20 V / 10 µ, ± 1 V / 1 µ
Input voltage ranges	± 1.25, ± 2.5, ± 5, ± 10 V	Output ranges	0 – 10 V, ± 10 V
	0 – 1.25, 0 – 2.5, 0 – 5, 0 – 10V		
IEPE sensor supply	3.6 mA / 24V	Output current	± 5 mA
Precision of system	0.009 % = 1.8 mV	Output impedancy	0.2 Ω
	0.0025% = 0.5 mV, 16x oversampling		
Maximum input voltage	± 40 V	Non linearity	± 2 LSB
Gain accuracy	0.2 % typical		
BIAS current	± 40 nA		
Non linearity	± 3 LSB, 16x oversampling ± 1.5		
Quantisation error	< ± 1 LSB		
Effective precision	13.5, oversampling: 15.5 Bit		
Range error	trimable		< ± 0.025%, typ
Zero error	trimable		< ± 0.025%, typ
ADC bias drift	± 7 ppm / °C		± 5 ppm / °C
Monotonicity	± 1.5 LSB		15 Bit

Digital, Inputs/Outputs		Counter	PWM	Incremental	
Number of inputs	24	Number of counters	2	Number	1/1
Logic family	LVCM / OS	Resolution	24	Resolution	24/16
Logic sense	High	Modes		Incremental/time stamp	
Maximum input voltage		Event counting up/down		20 MHz max.	
In operation	+ 5 V	Frequency measurement		Interpolation	1/2/4
Logic High Input Voltage	2,0 V	Resolution	1/10/100/1000 Hz		2.0 V
Logic Low Input Voltage	0.8 V	Period length measurement / pulse			0.8 V
Logic High Input Current	0,5 µA	Width measurement res.	100 ns		0.5 µA
Logic Low Input Current	0,1 µA				0.1 µA
Logic High Output Current					
Logic Low Output Current					

Signal processor DSP56311, clock frequency 150 MHz 7.5ns, 255MIPS, 128K\*24 Bit internal and 1.5 MByte external RAM  
 Power supply Adapter 100 V – 230 V AC / 5 V DC (included)  
 Connector Phoenix MDSTB (digital) and MSTBA (analog), BNC (analog)  
 USB 2.0 480 MBit, USB 1.1 12 MBit compatible  
 Dimensions 180 mm (W) x 167 mm (D) x 80 mm (H), Weight: Approx. 2 kg.

